

CLAIMS

1. A prosthesis for at least partially restoring vision to a user suffering from a photoreceptor degenerative condition, said prosthesis including:
  - 5 a secondary coil configured for mounting in the vitreous body of a user's eye for responding to a coupled input signal to produce an output signal;
  - an electrode array configured for implantation in said user's eye; and
  - signal processing circuitry responsive to said output signal for
  - 10 applying an image signal to said electrode array for stimulating retinal cells in said user's eye.
2. The prosthesis of claim 1 wherein said signal processing circuitry is contained in a hermetically sealed housing configured for mounting
 - 15 in said vitreous body.
3. The prosthesis of claim 2 wherein said housing is oriented relative to said secondary coil to minimize the generation of eddy currents in said housing.
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4. The prosthesis of claim 1 wherein said signal processing circuitry is contained in a protective housing configured for extraocular mounting; and further including
 - conductive wires for electrically connecting said signal processing
- 25 circuitry through the user's scleral wall to said secondary coil and said electrode array.
5. The prosthesis of claim 1 wherein said secondary coil is configured for mounting in said vitreous body with the axis of said secondary
 - 30 coil extending substantially coincident with the optic axis of the user's eye.
6. In combination with a user's eye characterized by a lens and a sclera wall enclosing a vitreous chamber containing a vitreous body, and

including a retina supported adjacent to said vitreous body proximate to the intraocular side of said sclera wall, a visual prosthesis comprising:

a secondary coil for responding to input signal energy to produce an output signal, said coil being mounted in said vitreous chamber in  
5 thermal contact with said vitreous body;

an array of electrodes implanted proximate to said retina; and  
signal processing circuitry coupled to said secondary coil and responsive to said output signal for applying an image signal to said array of electrodes for electrically stimulating said retina to present an apparent image  
10 to said user.

7. The combination of claim 6 further including a hermetically sealed housing containing said signal processing circuitry; and wherein said housing is supported in said vitreous chamber in thermal  
15 contact with said vitreous body.

8. The combination of claim 7 wherein said housing defines first and second perpendicularly oriented dimensions and wherein the housing is oriented in said vitreous chamber with the lesser of said dimensions  
20 extending substantially perpendicular to the axis of said secondary coil.

9. The combination of claim 6 further including a housing containing said signal processing circuitry;  
said housing being mounted proximate to the extraocular side of  
25 said sclera wall; and  
conductive wires electrically connecting said signal processing circuitry through said sclera wall to said secondary coil and said array of electrodes.

30 10. The combination of claim 6 wherein said secondary coil is mounted with its axis substantially coincident with the optic axis of said user's eye.

11. A visual prosthesis for at least partially restoring vision to a user suffering from a photoceptor degenerative condition, said prosthesis comprising:

- an image acquiring portion for producing a real image signal
- 5 representative of a real image; and
- a stimulating portion for electrically stimulating the user's retina to present an apparent image to the user;
- said stimulating portion including:
  - an array of electrodes mounted in the user's eye
  - 10 proximate to said retina and electrically connected thereto; and
  - a protective housing containing signal processing circuitry responsive to said real image signal for applying an apparent image signal to said electrode array for stimulating said retina to present said apparent image; and wherein
  - 15 said housing is mounted in the vitreous body of the user's eye in good thermal contact therewith.

12. The prosthesis of claim 11 wherein said image acquiring portion includes a primary coil; and
- 20 said stimulating portion includes a secondary coil; and wherein said primary and secondary coils are mounted in close proximity for coupling said real image signal from said image acquiring portion to said stimulating portion.

- 25 13. The prosthesis of claim 12 wherein said secondary coil is mounted in the vitreous body of the user's eye in good thermal contact therewith.

14. The prosthesis of claim 12 wherein said primary and secondary
- 30 coils are supported substantially coincident with the optic axis of the user's eye.

15. The prosthesis of claim 13 wherein said housing is oriented relative to said secondary coil to minimize the generation of eddy currents therein.

5 16. A visual prosthesis for at least partially restoring vision to a user suffering from a photoceptor degenerative condition, said prosthesis comprising:

an image acquiring portion including an extraocular primary coil for producing a real image signal representative of a real image; and

10 a stimulating portion for electrically stimulating the user's retina to present an apparent image to the user;

said stimulating portion including:

a secondary coil coupled to said primary coil for producing an output signal in response to said real image signal;

15 an array of electrodes mounted in the user's eye proximate to said retina and electrically connected thereto; and

a protective housing containing signal processing circuitry responsive to said output signal for applying an apparent image signal to said electrode array for stimulating said retina to present said apparent image; and

20 wherein

said housing is mounted adjacent to the extraocular side of the user's sclera wall.

17. The prosthesis of claim 16 wherein said secondary coil is  
25 mounted in the vitreous body of the user's eye.

18. The prosthesis of claim 16 wherein said primary coil and said secondary coil are mounted substantially in alignment with the optic axis of the user's eye.

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19. The prosthesis of claim 16 wherein said primary coil and said secondary coil are substantially aligned with one another along an axis displaced from the optic axis of the user's eye.

20. A method for implanting a visual prosthesis in the eye of a user including:

fixing a secondary coil in the vitreous chamber of the user's eye in thermal contact with the vitreous body in the chamber;

5 mounting a protective housing containing signal processing circuitry in close proximity to said secondary coil;

connecting an electrode array to the user's retina; and

electrically connecting said signal processing circuitry to said secondary coil and said electrode array.

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21. A method of deploying a visual prosthesis for a user to at least partially restore vision comprising the steps of:

generating a real image signal representative of a real image;

15 mounting a protective housing containing signal processing circuitry in the vitreous body of a user's eye in good thermal contact therewith;

coupling said real image signal to said signal processing circuitry to produce an apparent image signal;

connecting an electrode array to the user's retina; and

applying said apparent image signal to said electrode array.

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